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Outline

- Emporia State Economic Index is a new measure of economic activity in Kansas

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What's Wrong with State GDP?

- The ultimate measure of the economy: GDP

- Look at the last year for Kansas:
  - 2016Q3 – Jul-Aug-Sept – $153,801
  - 2016Q4 – Oct-Nov-Dec – $154,574
  - 2017Q1 – Jan-Feb-Mar – $155,204
  - 2017Q2 – Apr-May-Jun – NA
  - 2017Q3 – Jul-Aug-Sept -- NA

- Two problems:
  - Timeliness
  - Frequency

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How Can We Do Better?

- What do we know that is timely and frequent?
  - Employment Data
  - Housing Sales
  - Philadelphia Fed Coincident Index
  - Imports-Export Data
  - Sales Taxes
  - Oil Prices
- We use this data to estimate monthly state GDP

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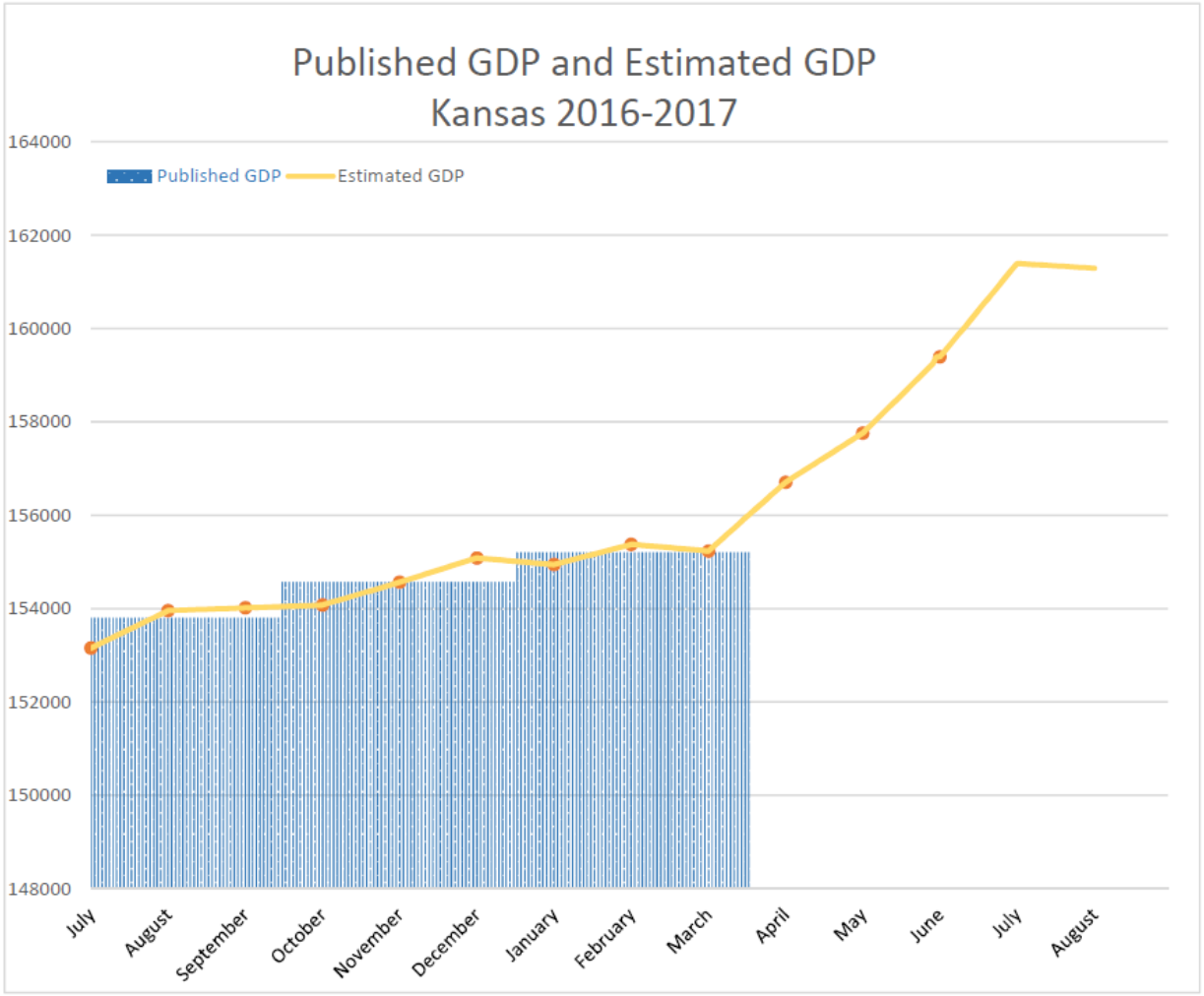
Measured vs. Estimated GDP

*Step 1: Use quarterly data to understand the relationship between GDP and those variables.

*Step 2: Use this knowledge to estimate monthly GDP.

*Step 3: Use the known quarterly data to correct the estimates.



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Estimated GDP: Step 1

Use quarterly data to understand the relationship between GDP and those variables.

- Data (quarterly historical)
  - GDP
  - Employment Data
  - Housing Sales
  - Philadelphia Fed Coincident Index
  - Imports-Export Data
  - Sales Taxes (OK)
  - Oil Prices (OK)

The ARIMA Model :

$$GDP_i = \alpha_0 + \alpha_1 Emp_i + \alpha_2 Home_i + \alpha_3 Philly_i + \alpha_4 Imports_i + \alpha_5 Exports_i + \alpha_6 Tax_i + \alpha_7 Oil_i + \varepsilon_i$$

Now we have coefficients: α_0 , α_1 , α_2 , α_3 , α_4 , α_5 , α_6 , and α_7

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Estimated GDP: Step 2

Use this knowledge to estimate monthly GDP.

- Known (monthly, current data)
  - Employment Data
  - Housing Sales
  - Philadelphia Fed Coincident Index
  - Imports-Export Data
  - Sales Taxes (OK)
  - Oil Prices (OK)
- Known
  - Coefficients: α_i for i = 1 .. 7
- Unknown
  - GDP

The Simulation:

$$\hat{Y}_i = \alpha_0 + \alpha_1 Emp_i + \alpha_2 Home_i + \alpha_3 Philly_i + \alpha_4 Imports_i + \alpha_5 Exports_i + \alpha_6 Tax_i + \alpha_7 Oil_i$$

Now we have an estimate of monthly GDP ($\hat{Y}$).

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Estimated GDP: Step 3

Use the known quarterly data to correct the estimates.

- Condition 1: Adjusted monthly GDP averages to known quarterly GDP

$$(\ddot{Y}_{jan} + \ddot{Y}_{feb} + \ddot{Y}_{mar})/3 = GDP_{Q1}$$

- Condition 2: growth rates of adjusted monthly GDP are in proportion to growth rates of simulated monthly GDP.

$$\frac{\ddot{Y}_{mar}}{\ddot{Y}_{feb}} = \gamma \frac{Y_{mar}}{Y_{feb}}$$

and

$$\frac{\ddot{Y}_{feb}}{\ddot{Y}_{jan}} = \delta \frac{Y_{feb}}{Y_{jan}}$$

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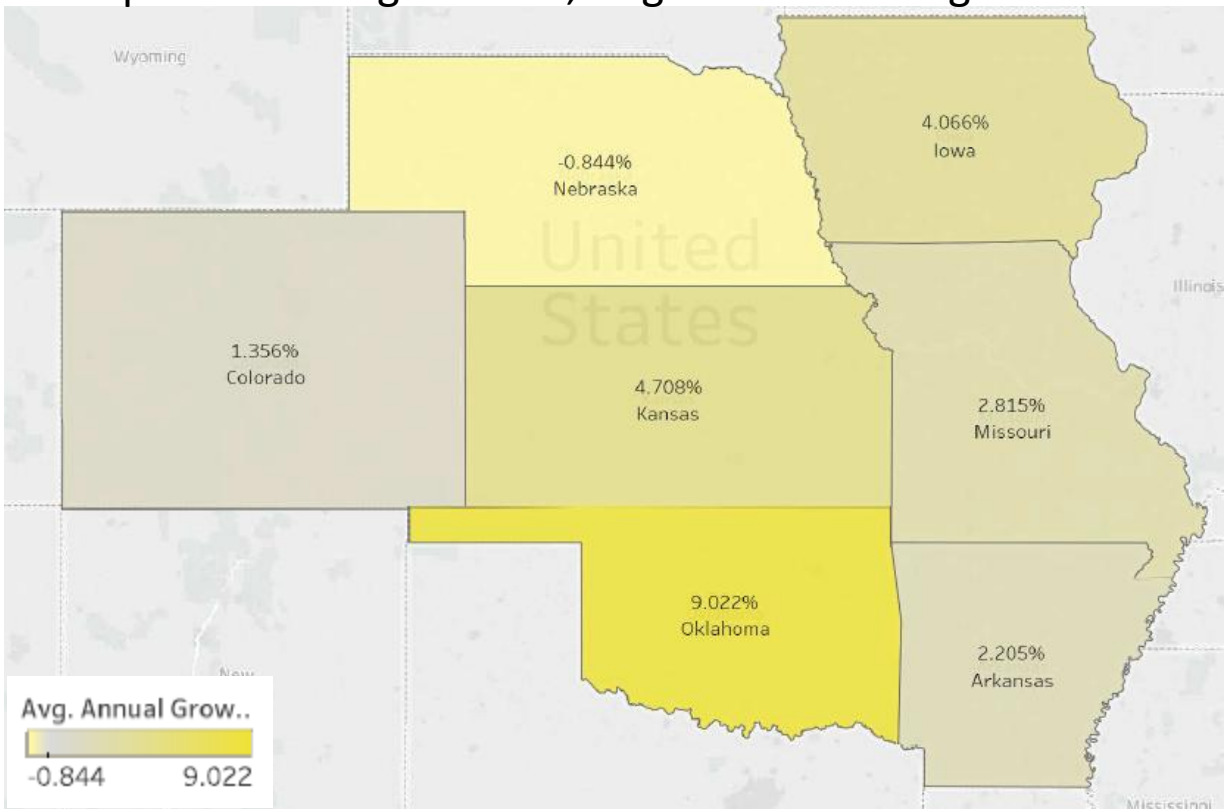
Kanas GDP in Context

percent change of ESEI, August 2016 to August 2017



We predict GDP for Kansas plus a 6-state reference group

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Emporia State Economic Index

- From the GDP estimate, we calculate an Index
  - First we calculate per capita GDP
  - GDP / Population
  - Then we rebase this estimate to the 2009 average across the states
  - Per Cap GDP / 2009 per cap GDP average

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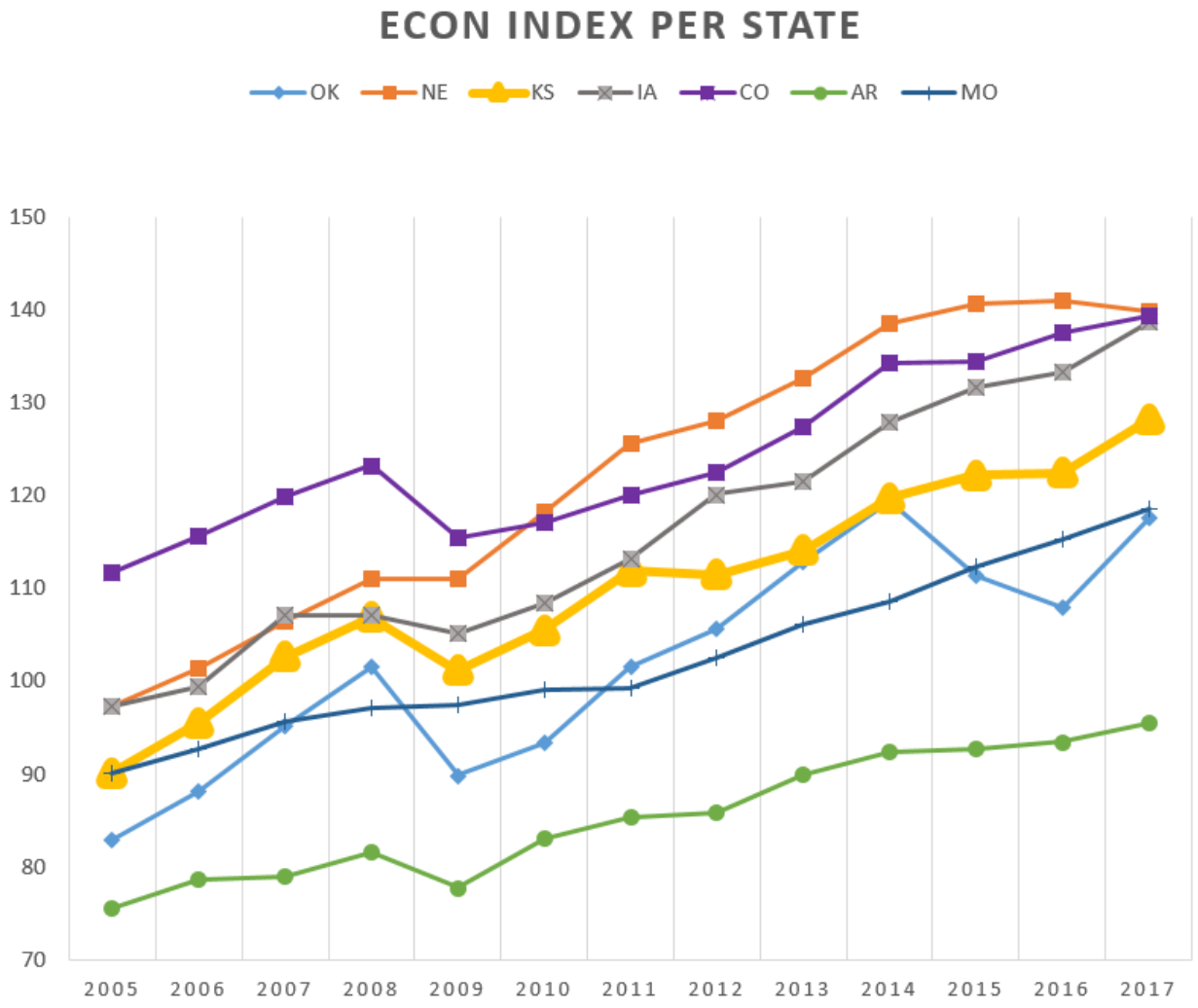
Economic activity

- KS is mid-pack
- KS leads MO
- AR trails
- AR is below 100
- NE sets the pace



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Most recent activity

Economic Index Growth rate per state

*All numbers are in percentage

	August 2016	September 2016	October 2016	November 2016	December 2016	January 2017	February 2017	March 2017	April 2017	May 2017	June 2017	July 2017	August 2017	Annual Growth
AR	-0.10	0.01	0.41	0.14	0.165417	0.20	0.53	0.65	0.47	0.32	0.08	-0.21	-0.61	2.20
CO	0.58	0.56	-0.06	0.10	-0.23	0.17	0.26	-0.03	-0.01	0.48	0.30	-0.16	-0.04	1.35
IA	-0.15	-0.76	0.642114	0.22	0.77	-0.18	-1.57	1.26	-3.06	2.31	1.37	1.17	1.94	2.30
KS	-0.16	-0.43	0.50	0.47	0	0.02	0.44	-0.20	0.94	0.66	1.03	1.25	-0.07	4.06
MO	0.92	-7.55	6.70	3.21	6.15	-1.48	-0.16	12.26	-6.13	13.52	-0.50	-0.35	7.90	4.70
NE	0.40	0.61	-0.19	0.11	0.14	0.09	-0.84	-0.06	-0.97	0.44	-0.34	-0.71	0.90	-0.84
OK	-0.21	0.22	0.26	-0.17	3.17	1.01	-2.76	1.04	2.27	-0.41	1.72	1.94	0.48	9.02

- KS has strong growth
- OK and MO are stronger
- NE has dropped a bit

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Conclusion

- Monthly GDP is an innovative tool to understand and predict economic activity
- The new economic index is more timely and frequent than the BEA data
- New opportunities are open for:
- economists to have a real-time economic indicator
- businesses to follow consumption trends timely and predicts Peak times
- researchers and students for their research/papers

➔**Watch for the ESEI Data Every Month**

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